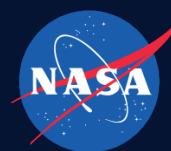


# Cubesat SEP Power Module, Phase II Project

SBIR/STTR Programs | Space Technology Mission Directorate (STMD)



## ABSTRACT

As electronics continue to shrink, the capabilities of CubeSats continue to expand. This offers the possibility of entirely new mission classes for space exploration. However, CubeSats small surface area limits their power availability. Typical CubeSat arrays are <100 W. The low power limits their capability, particularly as increased distance from the sun reduces power further. The low power limits instrument selection, telecommunications options, and electric propulsion usage. To resolve these issues, ExoTerra has developed a CubeSat Solar Electric Propulsion Power Module. The module incorporates a lightweight deployable solar array with up to 296 W (BOL) of power. The module efficiently delivers the power to a micro Hall Effect Thruster at nearly 300 V via a direct drive power distribution card. The specific power of over 140 W/kg and power density of over .17 W/cm<sup>3</sup> efficiently packages the module into a 6U CubeSat. When not needed for electric propulsion, the card steps the voltage down to either 28 or 12 V to deliver high power for either instrument or telecommunications use. ExoTerra builds on the Phase I prototype and functional testing effort by building a qualification unit of the array and direct drive electronics in Phase II. During the period of performance, we initiate functional and environmental testing to push towards commercializing the technology.

## ANTICIPATED BENEFITS

### To NASA funded missions:

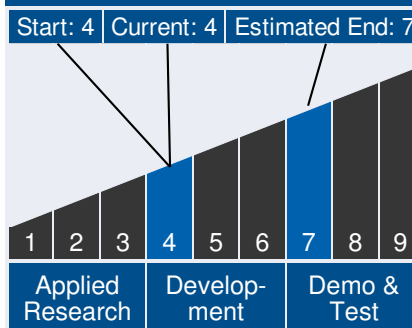
Potential NASA Commercial Applications: The technology enables multiple NASA mission opportunities. CubeSats offer the potential for low cost exploration throughout the inner solar system. With the higher power availability, CubeSat missions can power high deltaV Electric Propulsion to perform interplanetary trajectories. Once at the target, the arrays enable high power instruments such as lidar for imaging and long range



## Table of Contents

Abstract . . . . .	1
Anticipated Benefits . . . . .	1
Technology Maturity . . . . .	1
Management Team . . . . .	1
U.S. Work Locations and Key Partners . . . . .	2
Image Gallery . . . . .	3
Details for Technology 1 . . . . .	3

## Technology Maturity



## Management Team

### Program Executives:

- Joseph Grant
- Laguduva Kubendran

### Program Manager:

- Carlos Torrez

*Continued on following page.*

# Cubesat SEP Power Module, Phase II Project

SBIR/STTR Programs | Space Technology Mission Directorate (STMD)



telecommunications to send the data back. The lightweight arrays also enable CubeSat missions to be conducted further from the sun in low flux regions such as near earth asteroids and even Mars.

## Management Team (cont.)

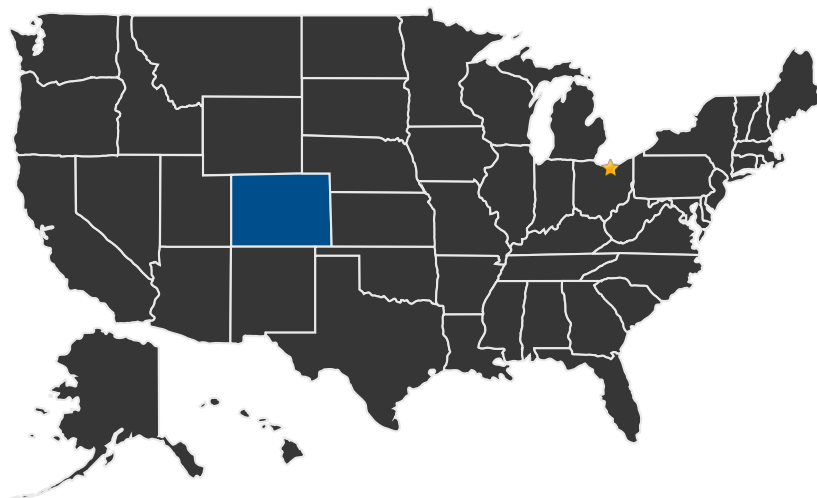
### Principal Investigator:

- Michael Vanwoerkom

## To the commercial space industry:

Potential Non-NASA Commercial Applications: The high power arrays have multiple commercial applications as well. CubeSats have the potential to replace large monolithic satellites with constellations of microsatellites. The high specific power benefits CubeSats and Microsats generically through reduced weight and launch volume. This capability can enable the use of higher power payloads or telecommunications. The arrays also form the foundation of a CubeSat SEP module that can provide high dV rideshare compatible propulsion for the first time. This enables CubeSats to alter their trajectory from their drop-off orbit and maintain their ideal orbit once they arrive for coordinated constellations.

## U.S. WORK LOCATIONS AND KEY PARTNERS



■ U.S. States  
With Work

★ Lead Center:  
Glenn Research Center

# Cubesat SEP Power Module, Phase II Project

SBIR/STTR Programs | Space Technology Mission Directorate (STMD)



## Other Organizations Performing Work:

- ExoTerra Resource, LLC (Lone Tree, CO)

## PROJECT LIBRARY

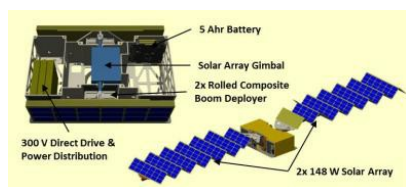
---

### Presentations

- Briefing Chart
  - (<http://techport.nasa.gov:80/file/23583>)

## IMAGE GALLERY

---



*Cubesat SEP Power Module, Phase II*

## DETAILS FOR TECHNOLOGY 1

---

### Technology Title

Cubesat SEP Power Module, Phase II

### Potential Applications

The technology enables multiple NASA mission opportunities. CubeSats offer the potential for low cost exploration throughout the inner solar system. With the higher power availability, CubeSat missions can power high deltaV Electric Propulsion to perform interplanetary trajectories. Once at the target, the arrays enable high power instruments such as lidar for imaging and long range telecommunications to send the data back. The lightweight arrays also enable CubeSat missions to be conducted further from the sun in low flux regions such as near earth asteroids and even Mars.